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# THE AMERICAN JOURNAL OF PSYCHOLOGY

Founded by G. STANLEY HALL in 1887.

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VOL. XV.

JANUARY, 1904.

No. I.

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## A THEORY OF TIME-PERCEPTION.

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### I.

#### THE SPECIOUS PRESENT.

The first question to be faced in a study of time-perception is the question of the "specious present;" for without the consciousness of an extended segment, or period, of past time it would be impossible to perceive either duration or succession. This problem of the specious present is not only the most important,—it is also the most perplexing of the many problems of our time consciousness. It is a case in which sense-perception presents as an actuality what Reason must regard as an impossibility. The present of metaphysical or conceptual time is a point, separating past and future; the present of psychological time—the specious present—is a continuous segment extending appreciably into the past. We cannot hope to solve this antinomy by violating Reason; we must not accept the presence of what is no longer present as a reality. Sense must be subordinated to Reason, and the specious present must be regarded as specious, as an illusion which is somehow explicable on the assumption that the real present is a point. The problem may then be stated as follows:

*How is it that at any one moment there can appear to be present several moments?*

### II.

#### THE MEASUREMENT OF TIME.

Time is the form of change, and the amount of change is the measure of the time which is perceived to have elapsed during the change, precisely as the size of a body is the measure of the

space actually or possibly filled by the body.<sup>1</sup> Taken in abstraction from all content, space and time, if not nothing, are at least quite without determinate form and size. As space and time are measured by what fills them, so, too, is the concrete filling measured by comparison with other concrete filling. A body is large or small according to the smallness or largeness of a second body selected as standard of measure. A change is great or small according to its relation to some other change which we take as a basis of comparison. Magnitude, whether conceptual or perceptual, is intrinsically relative.

### III.

#### THE SUBJECTIVE AND OBJECTIVE ASPECTS OF A PSYCHOSIS.

Every psychosis has two distinguishable but inseparable aspects, the subjective and the objective. The subjective element or 'knowing thought' is the whole system of conscious contents taken collectively and including the incoming content, while the latter is the *object* of the (normally prospective) act of attention. A content is perceived as an object only in so far as it is projected upon a subjective background of pre-existing states. In Herbertian terms, we may describe every psychosis as the assimilation of an entering sensation-mass by a receiving apperception-mass.

I believe that the solution of the problem of the specious present depends on our realizing that the subjective and objective elements of a psychosis possess differing rates of change.

What is sometimes called the Law of Relativity is an expression of the fact that in consciousness every content is determined not only by its stimulus, but also by every other content. A change in one state is necessarily attended by a change in the other states, both individually and collectively. If we are right in regarding the knowing thought or subjective aspect

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<sup>1</sup>It might be objected that the experience of unequal amounts of change occurring in equal times is in flat contradiction to the statement that time is measured by its contents. When, however, we seek for the grounds on which the two unequally filled times are judged equal, we see that their estimated equality arises from our comparing them, not with an absolute time, but with other changes of content, either those of our subjective consciousness or those of a third object, such as a clock. That absolute or empty time does not enter as a factor into the perceptual estimate of time is further shown by the fact that when equal time-intervals containing unequal quantities of change are perceived separately and without relation to a third object, they are, as a matter of fact, felt to be unequal. And the estimated inequality of their times is in proportion to the perceived inequality of their contents. Notwithstanding the uselessness of absolute time as a standard of perceptual measurement, the idea has a certain validity. The absolute clock is the totality of things, viewed as a single system.

of a psychosis as the totality of existing states, considered as forming a system having a single structure, or configuration, it will be clear that the changes induced in the form of that totality by a change in one of its parts will usually be less than the change in that part. In a word, a change in one conscious state produces a change (though a less change) in the system of states; and other things equal, the larger the apperception-mass, the smaller the changes produced in it by the changes in any one of its sensory aspects. The perception of a change is a changing perception, but a perception that changes less rapidly than the change that is perceived.

It cannot be too strongly emphasized in this connection that the increment of change produced in a conscious state,—or apperceptive system of states,—while it varies directly with the stimulus causing it, also varies inversely with the content in which it is caused. Thus if  $s$  be a conscious state and  $\Delta s$  be its increment of change,  $\Delta s$  will be large in proportion as  $s$  is small. In this respect, and, so far as I can see in this respect only, do increments of *change* differ from the increments of *substance*, ordinarily considered in the calculus.

There is a second point to which I would especially call the reader's attention before proceeding further. I have spoken, and shall speak throughout, of conscious states as quantities, expressible by quantitative symbols, and subject to quantitative laws: yet, nevertheless, these quantitative expressions can be, *and perhaps should be*, interpreted as applying to the *physiological concomitants* of conscious states. The reader who is sensitive on this subject can substitute the physical for the psychical interpretation of the quantitative symbols, without changing the meaning of the argument at any point.

Let  $\Delta o$  symbolize the amount of change or alteration in the objective content  $o$  produced in any period of time  $\Delta t$ , and let  $\Delta s$  symbolize the resulting change produced in the subjective aspect of consciousness during the same time. Then  $\frac{\Delta o}{\Delta s}$  will

represent a change in the objective as compared with the change in the subjective element in the time  $\Delta t$ . As  $\Delta t$  is made to decrease without limit,  $\Delta o$  and  $\Delta s$  will correspondingly decrease, but the fraction  $\frac{\Delta o}{\Delta s}$  will not necessarily decrease, but will either

approach, or if the rate of change be uniform, will maintain the finite value  $\frac{do}{ds}$ . Now this derivative of the objective change with regard to the change of the subjective element is a finite quantity, but one that is realized at each infinitesimal moment of time. If we were right in affirming in the preceding section that perceptual space and time magnitudes are essentially

relative matters, determined not by the "absolute" size of the magnitude to be measured but by the ratio of that magnitude to the unit of measure, it will be evident that the amount of objective time or change which appears to be present at any one moment will be measured by its ratio to the subjective change which accompanies it. And if the subjective unit of measure be infinitesimal, the objective change-magnitude may be also infinitesimal and yet may *appear* finite. In short the infinitesimal time-change which occurs at the unextended metaphysical present will be appreciated as an extended psychological present, provided it be measured in terms of an infinitesimal of different order.

That  $\Delta s$ , the change in the subjective totality of conscious contents, is less or "slower" than  $\Delta o$ , the change in that phase of the totality selected as object by the act of attention, has been shown: consequently the symbol  $\frac{do}{ds} = \lim_{\Delta t = o} \left[ \frac{\Delta o}{\Delta s} \right] > 1$  may be accepted as properly representative of the "specious" or "extended" present; *and the latter is from this point of view seen to be compatible with the real or metaphysical present of conceptual time.*

#### IV.

##### DURATION AND SUCCESSION.

At the outset of our discussion it was stated that the perception of the specious present was prerequisite to the perception of duration and succession. Now introspection assures us that the specious present never maintains the same value from moment to moment. It is always either expanding or contracting. *But an increase in the specious present means an increase in the period of past time which appears at present, that is to say an increase in the time during which the events filling it have been perceived.* The objects or events, therefore, which occupy the expanding specious present are felt as "enduring," while conversely those that fill the contracting specious present are felt as "passing" or "succeeding." This alternate increase and decrease of  $\frac{do}{ds}$  implies of course a corresponding alternation in the sign of the second derivative. When an object  $o$  is perceived as enduring,  $\frac{d^2o}{ds^2}$  is positive; at the moment when  $o$  is succeeded and displaced in consciousness by some other object,  $\frac{d^2o}{ds^2}$  is negative.

#### V.

##### "TIME DRAGGING" AND "TIME FLYING."

The second derivative of the objective with regard to the

subjective change not only indicates by its *sign* the enduring or passing phase of its contents, but by its *magnitude* it marks the *seeming rate of the time-flow itself*. A small or large change-rate (whether increasive or decreasive) in  $\frac{do}{ds}$  means a correspondingly small or large value of  $\frac{d^2o}{ds^2}$ . In view of the fact previously mentioned that  $\frac{s}{o}$  varies as  $\frac{do}{ds}$ , it is interesting to note that, as might be expected, the first and second derivatives also vary inversely. The longer an event endures, *i. e.*, the greater the value of  $\frac{do}{ds}$ , the less the rate of its change, and the less the value of  $\frac{d^2o}{ds^2}$ . The further past an event seems, the more slowly does it appear to increase in pastness, while conversely, the events of the present are those which seem to fly by most rapidly.

This would seem to afford a clue to the curious alterations which we experience in the *rate* of time-flow. For it is obvious that when new objects continuously distract the attention, the specious present is constantly being destroyed and made anew; and, as we saw, this enforced smallness of  $\frac{do}{ds}$  would mean a correspondingly large value of  $\frac{d^2o}{ds^2}$ . The seeming rate of the time-flow is great in proportion to the number of new distractions. And conversely when the mind is without internal or external distractions, when there is nothing to think about and nothing to do, the specious present with its single content of *ennui*, *i. e.*, the consciousness merely of being conscious, grows to an enormous size with a consequent decrease in  $\frac{d^2o}{ds^2}$ , a decrease, that is to say, in the apparent rate of the time-flow. Time here is felt to *drag* as in the presence of distraction it is felt to *fly*.

## VI.

### THE RHYTHMIC CHARACTER OF CONSCIOUSNESS.

We have only to reflect upon the nature of the specious present as already described to understand the intrinsically rhythmic character of consciousness.

Let us suppose a mind to experience a series of sensations  $o_1, o_2, o_3, o_4$ , in moments  $t_1, t_2, t_3, t_4$ . The specious present at  $t_2$  has a duration of two moments and contains the image-trace of  $o_1$ , and also the sensation  $o_2$ ; and the specious present at  $t_3$  has a duration of three moments and contains in addition to the sensation  $o_3$ , the images of  $o_1$  and  $o_2$ . From the persistence of images the specious present tends to increase not only in "length" but in contents. This increase is not in a finite consciousness unlimited, but depends upon the degree to

which the accumulating contents are harmonized in a single meaning.

In consciousness as we know it, each content is to some degree a *rival* of its fellows. Of course it is also true that different contents to some extent support and enhance one another, and the law (first formulated, I believe, by Fechner) that the intensity of attention varies inversely as its extent is only a half truth. That is to say, it is only true for psychoses in which the "competition" of contents tends to become stronger than their "co-operation." The law is in general, however, rather more true than false, because as the number of elements in a system increases, co-operation becomes less easy and antagonism less difficult. And as the sweetest toned instrument will, if too loudly or too variously excited, reach a point at which the dissonance of the over-tones will exceed their harmony, so with the specious present there inevitably comes a time when the manifoldness of its contents makes their unity no longer capable of transcending their variety.<sup>1</sup>

Returning to our example we will suppose that in the mind which has experienced  $o_1$ ,  $o_2$ , and  $o_3$ , the specious present has reached the critical point at which the further dispersal of attention demanded by a new content will result in its dissolution. The new content  $o_4$  enters; the specious present ceases its slow expansion and begins rapidly to contract. The images of  $o_1$ ,  $o_2$  and  $o_3$  crumble away and the attention thus liberated is caught by the strongest bidder which, in our case, is the present sensation  $o_4$ . On this as foundation a new specious present is rapidly built up, containing as a halo or "fringe" the shade of its parent. It is important to bear in mind the fact that the manner in which our specious presents are destroyed is different from the manner in which they are rebuilt. The old contents do not flow out as the new contents flow in. The events which are born singly die in cycles.

A rhythmic series of experiences affects us strongly and holds our attention because its objectively recurring periods harmonize with the subjectively recurring contractions and expansions of the specious present, each series being thus reinforced by the other. Subjectively viewed, the rhythmic character of consciousness is due, as we have seen, to the fact that each specious present contains in addition to the birth-seeds of new presents the seed of its own decay. Like other live things our time-

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<sup>1</sup>Professor Loeb (*Comparative Physiology of the Brain*, Ch. XIX) holds that the intensity of a mental state is diminished by the simultaneous presence of other states, when and only when the underlying physiological processes are *aperiodic*. Simultaneous periodic processes so far from diminishing may actually enhance each others' intensity.

consciousness is rhythmic, because like them it is born with the canker of death at its heart.

## VII.

### MEMORY.

So far we have been dealing with the immediate apprehension of the just past. We have now to discuss the bearing of the theory upon the consciousness of the more remote past. Memory proper, or recall, is differentiated from the consciousness of the just past, by the fact that in the latter the event has been continuously present to consciousness since the time of its occurrence, while in recall, as the word indicates, the event remembered has been absent from consciousness between the time of its occurrence and the time of its recurrence. Every case of memory is thus a case of recurrence, but every case of recurrence is not a case of memory. In addition to the fact of recurrence there must be a recognition of recurrence, a recognition that something is being experienced *again*. The mere fact of recurrence is not difficult to understand. If the physiological ground or concomitant of an experience leaves as a trace of itself a specific modification of the brain structure—a “path,” for example,—it is natural that when that particular part of the brain is re-excited, whether by stimulus or from within, we should re-experience the content. The really curious thing about memory is not the recurrence but the recognition of the recurrence; the consciousness of having experienced the *same* content at a more or less definitely localized moment of the past. Now we have seen that within the scope of a single specious present the amount of time which has elapsed since the occurrence of an event is measured by the ratio of its change-rate to the change-rate induced by it in the apperceptive system upon which it is “projected.” This apperceptive system or apperception-mass is (when the attitude of attention is retrospective) nothing but the collective totality of contents which have been perceived since the event in question first appeared. And the change-rate of such a system is inversely proportional to its size. The specious present, then, increases with the increase of the apperception-mass, and hence the extent of the latter suffices to measure not only the duration of time from a point in the past up to the present, but conversely, the felt distance of that point from the present, *i. e.*, its date. Thus when the specious present is large, the date of its earlier events is felt to be remote, while, conversely, the earlier events of a small specious present are felt to be of recent date.

I believe that the date of a remembered object is measured in the same way. The specifically modified brain-cell, when



re-excited, excites in its turn the physiological traces of the experiences intervening between its first occurrence and the present moment, with the result that these intervening experiences vaguely and very schematically recur as an apperception-mass for the recurrence of the content which suggested them. And precisely as in the case of the specious present, the rate of change in this apperceptive system is, in proportion to its extent, small as compared with the change in the single content. The ratio of the latter to the former— $\frac{do}{ds}$ —measures and represents the date, *i. e.*, the period of time that appears to have elapsed since the event first occurred. But the remembered event is not only projected upon this large and schematic apperception-mass: it is, together with the latter, projected also upon the background of concrete experiences which fill the regular specious present of the moment. Thus it appears to us in *two* contexts or aspects—as a present event in our mental life and as an event of the past. The *againness* of the remembered event is due precisely to this duality of its apperceiving system.

The view that the date or temporal sign of a remembered happening is determined by the recurrence of the intervening experiences is borne out by the recognized facts of the memory consciousness. For, in the first place, we can recall the date of an event only when we have some memory of what has followed it. (By date I mean of course the *felt* date, not the date as abstractly known.) When the intervening experiences are numerous and interesting, the apperceptive system *s*, in which they schematically recur, is large, and the differential fraction  $\frac{do}{ds}$ , which measures the lapse of time since the occurrence of *o*, is also large. While, conversely, when few experiences have intervened between an event and our memory of it, the apperception-mass is small and the date appears more recent than it is.<sup>1</sup> Finally, when the activity of the perceptive faculty is completely suspended, as in trance or change of personality, and when consequently there are no intervening experiences out of which to make a memory apperception-mass, we find, as our view would lead us to expect, no appreciation of the period of time separating the remembered event from the moment at which it is remembered. In such cases, the events of months ago are regarded as those of yesterday.

In spite of the "concomitant variation" of the number of intervening experiences and the distance of the assigned date of the remembered event, it may still seem that we have not sufficiently explained the profound difference between memory of

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<sup>1</sup>The rate of time-flow is, as we know, reversed in retrospect. Periods that felt brief when passing are remembered as long, and *vice versa*.

the remote past and immediate consciousness of the just past. In order to remove any such misgivings, let us sum up the points of difference already noted between the two kinds of consciousness of the past. In the first place, in immediate apprehension the apperception-mass is the concrete complex of experiences which having just occurred have not yet faded from consciousness. In memory, on the other hand, the principal apperception-mass is a vast, hazy, highly schematic group of contents, the merest skeleton of the experiences of the intervening period. And secondly, in addition to this contrast in the backgrounds upon which the two kinds of past are respectively projected, there is a single background in the case of immediate apprehension, while in memory there is a double background,—the schematic system just mentioned, and the concrete system of contents which makes up the specious present of the moment in which the act of memory takes place. And to this duality of apperceptive context is due, as we have seen, the feeling of ‘againness’ or recurrence which is distinctive of the memory psychosis.

## VIII.

### FAMILIARITY.

The feeling of familiarity, which is akin to memory, differs from recall proper in two ways. In the first place the event recognized as *familiar* is normally caused by an external stimulus, and hence possesses the vividness and arbitrary ‘givenness’ characteristic of a sensation as distinguished from an image. And in the second place, the memory apperception-mass is so entirely subordinated to the specious present in which the familiar sensation occurs that it serves merely to give to the latter a fringe of pastness in which there is no appreciable indication of date. In short the feeling of familiarity is the apprehension of a present event with a fringe of pastness, or ‘recurringness,’ while in the memory judgment, the recognition of a more or less definitely dated past is primary, and is only secondarily qualified by a fringe of presentness due to the act of memory itself.

## IX.

### THE CONDITIONS UNDER WHICH TIME PERCEPTION ORIGINATES.

When we inquire how a specious present begins or how it can apply to a single sensation, we are confronted by a peculiar difficulty. According to our view there must always be a pre-existing background of mental states upon which the content perceived as an object is projected. But in the first

moment of a psychosis, or in the case of a single sensation, this would seem impossible. And yet when we are awakened from a state of unconsciousness by a touch or a sound, we do not experience a sensation that is without duration. If anything, the time-form is more noticeable in the simple and approximately sensational first stage of an experience than in the later and more complex stages. The *meaning* of a sensory content is felt only when we feel its relation to other contents: but not so with its duration. As soon as it is perceived, or rather, in order that it may be perceived, we must be conscious of it as enduring. Our problem is to point out what it is that plays the part of apperception-mass in the case of a single sensation and at the first moment of an experience.

Let us begin by considering the case of a possible single sensation which has established itself in consciousness. Along with the sensation at any moment will be the consciousness of it as it was in the just preceding moments. Let  $o_4$  represent the sensation at the fourth second of its existence, and  $o'_1, o'_2$  and  $o'_3$  symbolize the present image-traces of its earlier existence. It will be sensed in the light of these image-traces precisely as an incoming element in a complex psychosis is apperceived by the other elements. The "apperceptive system" for a single sensation—if such were possible—would then be nothing but the image-traces of its just-past existence. And the specious present,  $\frac{do}{ds}$ , of such a sensation would be expressed

(at the fourth second) by the symbol  $\frac{do_4}{d(o'_1 o'_2 o'_3)}$ . When the

apperceptive system or subjective background, composed of the image-traces  $o'_1 o'_2 o'_3$ , became greater, or more prominent for consciousness than the present sensation  $o_4$ , the rate of change of the former would become less than that of the latter, *i. e.*,

$\frac{do_4}{d(o'_1 o'_2 o'_3)} > 1$ —and a specious present or perceptual time-form would be realized.

So much for the time-form of a single sensation after its origin. Can we make use of this account to explain the *simultaneous* origin of an experience and its time-form? Here as elsewhere, in explaining the origin of anything in consciousness, we are compelled to fall back upon those physiological processes which are the secondary, or it may be the proximate conditions of sensory states. When by the action of a specific stimulus an equally specific disturbance in the cortex is produced, the latter does not, we may suppose, die out the instant the stimulus ceases, but continues for a short time, as the violin string continues to vibrate after the bow has been withdrawn. If the same stimulus be applied again the resulting disturbance will be a complex of the pre-existing disturbance and the re-

newed effect of the stimulus. Now if the stimulus act in such a manner that the disturbance in the brain-center due to past action become greater than the effect of its present action, *there will be produced on the physiological level a perfect counterpart of the psychological conditions of the specious present.* That is, we shall have a "subjective" or pre-existing state of disturbance greater or more vigorous than the incoming impulse. The modification in the nerve center due to the just past will dominate that due to the present. If under these conditions a sensation arise, it will arise with a time form. Let us suppose a case in which a stimulus must act continuously for four seconds in order that a sensation may arise. We may represent the resulting disturbances of the central organ by  $o(-_4)$ ,  $o(-_3)$ ,  $o(-_2)$ ,  $o(-_1)$ , and their traces by the same symbols primed. We may suppose that at the moment when the sensation  $o_1$  arises, the physiological stimulus-traces  $o'(-_4)$ ,  $o'(-_3)$  and  $o'(-_2)$  are together equal in intensity to the impulse  $o(-_1)$ , and that when increased by the trace of the latter the pre-existing state will dominate the incoming state,—which, if it be felt at all, will be felt in a time-form or specious present represented by

$$\overbrace{\begin{matrix} d \\ o \\ \hline o_1 & o_1 & o_1 & o_1 \\ (-_4) & (-_3) & (-_2) & (-_1) \end{matrix}}^{\text{I.}}$$

Now inasmuch as every sensation which we can imagine ourselves to experience has a time-form, we must conclude that in defining the conditions of the origin of a specious present we have at the same time defined one of the essential conditions for the origin of conscious states in general.

The several steps in our argument may be summed up as follows:

I. The central fact of time-consciousness is the "specious present"—the present consciousness of what is no longer present. Without this apparent projection of past moments upon each present moment, there could be no consciousness of either duration or succession.

II. Time is the form of change; and change, like every magnitude, is relative to its unit of measure. The amount of perceived change in an object is relative to the actual concomitant change in the perceiving subject.

III. Regarding the 'object' as simply the objective aspect, and the 'subject' as the subjective aspect of a psychosis, we may hold that each incoming objective content is apperceived by or projected upon the entire system of pre-existing states. The psychosis considered only in its collective unity is subjective; considered only in its distributive plurality, it is an aggregate of objects; considered (as it must be) under both aspects simultaneously, it is a "subject-perceiving-objects." As the apperceptive system is larger than any of its objective contents,

the constant stream of increments and decrements produces in the latter changes that are proportionately greater or faster than the change that they in turn cause in the system as a whole. *This difference in the rates of an objective change and the subjective change which reflects it, measures the amount of perceived change and perceived time.* And though  $\Delta s$  and  $\Delta o$  (the actual subjective and objective changes respectively produced in  $s$  and  $o$  by the environmental increment of content) would approach zero as  $\Delta t$  approached zero, yet the ratio  $\frac{\Delta o}{\Delta s}$  would approach or maintain the finite value  $\frac{do}{ds}$ . And this for the same reason that the velocity of a moving body, if uniform, maintains, and if accelerated, approaches, a finite value, when the space through which and the time in which it moves approach zero. By assuming the amount of perceived time to be a continuously present *differential rate*, it becomes possible to reconcile the "specious," "vicarious," or "perceptual" presence of an extended segment of the past with the real or unextended present. Finite positive portions of time and change are perceived as present when  $\frac{s}{o}$ , and consequently,  $\frac{do}{ds}$  are greater than unity.

IV. Time is felt as *enduring* when  $\frac{do}{ds}$  is increasing in value; *i. e.*, when  $\frac{d^2o}{ds^2}$  is positive; and conversely, when the second derivative is negative, the events are felt as escaping or *passing*.

V. As the positive and negative *signs* of the second derivative respectively denote the enduring and the passing phases of perceptual time, so the *value* of the same ratio measures the perceived *rate* of time. Time "flies" or "drags" according as  $\frac{d^2o}{ds^2}$  is large or small. And as in this case the first and second derivatives vary inversely—*i. e.*, the longer the time-span or specious present the slower its rate of change—it follows that the events that are near to the present appear to *acquire pastness* more rapidly than those further past. (This I take to be the explanation of the apparent conformity of time-perception to Weber's Law.)

VI. A specious present tends constantly to increase, but this naturally cumulative tendency brings about automatically in every finite consciousness a counter-tendency; for in so far as the contents of a psychosis are not perceived in the light of a single plan, the degree to which each is attended to is inversely proportional to the number of all; and there comes a time when the content of longest duration can no longer hold the attention.<sup>1</sup>

<sup>1</sup>There are two fundamentally distinct features of a content that attract the attention—its intrinsic intensity and its extrinsic bearing upon other contents. The latter is the conceptual or unifying factor and is usually possessed in the greatest degree by the content of longest duration, because it is the center in relation to which the rest of the

That activity on being thus torn from its attachment to the keystone of the system, by the dissipative force of numbers, is for the moment open to the highest bidder, which is usually the most recent sensation; and about this as a center a new present is built up. This alternation of slow accumulation and rapid crumbling, in the time-span, throws light alike upon the rhythmic character of consciousness and upon the pleasurable-ness of objective rhythm.

VII. Memory differs from the immediate consciousness of the past in two ways. In the first place the remembered event (*i. e.*, the re-excited trace of the past experience) is projected upon a schematic and hazy apperception-mass, composed of traces of a few of the more important intervening experiences. This makes possible the felt date, while it enables us also to account for the indefiniteness and inaccuracy of it. In the second place the remembered event is less noticeably projected upon the concrete apperception-mass of the specious present in which the act of memory takes place. It is thus seen in two contexts, and to this duality of background its "againness" may be ascribed.

VIII. The feeling of familiarity differs from memory proper, in that the trace of the past event is excited sensorily from without, and is projected primarily upon the specious present of the moment, and only secondarily upon the background of intervening experiences. It is an experience of the present with a fringe of the past, while memory is an experience of the past with a fringe of the present.

IX. The manner in which a time-form can apply to a single sensation, and the manner which it can originate at all, present peculiar difficulties. Confining our attention to a possible single sensation, we find that in such a case the apperceiving background for the sensation, after its origin, would be composed of the image-traces of the sensation itself. The formula for the specious present becomes  $\frac{do}{do'}$  where  $o^1$  represents the pre-existing subjective traces due to the presence of the sensation in the preceding moments. But these quantitative symbols may with equal or, as some psychologists would hold, with greater propriety be used to denote the physiological concomitants of sensation. And the symbol  $\frac{do}{do'}$ , when taken physiologically, may represent a condition just *antecedent* to perception. From this point of view we can understand how it is that the time-form of a psychosis arises simultaneously with its contents.

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system is interpreted. On the other hand the intensive or sensory factor is peculiarly the property of the sensation of the moment—and it is the gradual but inevitable gain of the latter or centrifugal over the former or centripetal factor, that brings about the periodic dissolution of each psychosis.